

Dynamics of Agricultural Land and Sustainability of the Agricultural Sector in the Province of Bali 2015-2020

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ABSTRACT

The agricultural sector in Bali Province is increasingly being displaced by other sectors to support tourism. This is indicated by the reduction of agricultural land to non-agricultural land, even though agriculture is a sector that is very much needed by Balinese people to support life both in the present and in the future. The purpose of this study is to explain the analysis of land change, especially agricultural land in Bali Province 2010-2018 and to determine the sustainability of the agricultural sector in terms of production capability in basic the 2015-2020 period by mapping the areas of the base and non-agricultural base sector at the time of analysis and in the future. The research method uses secondary data analysis which is processed using the Skontro Table (assets-liabilities), the calculation of Location Quotient (LQ) calculation. Dynamic Location Quotient (DLQ), and LQ-DLQ Typology. The results showed that there was a change in the use of agricultural and non-agricultural land in Bali Province in 2010-2018 where lowland agricultural land always decreased every year. The results of the LQ calculation show that Gianyar Regency, Badung Regency, and Denpasar City are not agricultural-based sector areas and the value of DLQ for each region varies. After mapping in the LQ-DLQ typology, it was found that Quadrant I, namely Jembrana, Tabanan, and Bangli Districts; Quadrant II, namely Badung Regency; Quadrant III, namely Klungkung, Karangasem, and Buleleng Regencies; and Quadrant IV, namely Gianyar Regency and Denpasar City. This indicates that there are only three districts in Quadrant I that are truly superior and prospective for the sustainability of their agricultural sector in the future because they can meet the needs of agricultural products in their own regions and can meet the demands of other regions, and one district in Quadrant II which has the opportunity prospective sustainability of the agricultural sector in the future. The Bali Provincial Government targets a balance between economic sectors so that not only the tourism sector dominates and also seeks to attract millennials to develop agriculture so that the sector can maintain sustainable production.

Keywords: Land use change, Location Quotient, Dynamic Location Quotient, Agriculture Sector, Bali Province

1. INTRODUCTION

The agricultural sector in Indonesia has a role in economic growth. The level of revenue from the agricultural sector nationally can be known from the gross regional domestic product (GRDP) data.

Although national conditions are known, regional scales at both provincial and district levels need to be analyzed because the characteristics of each region are different. Certain physical and social characteristics cause the resources and potentials that are shared

between different regions [1]. Knowing the revenue from the agricultural sector of each province in Indonesia, the data used is gross regional domestic product (GRDP). For example, as well as the location of the study, Bali Province is an area that relies on the tourism sector for optimal economic growth [2]. Bali province is a well-known area through its agricultural sector apart from tourism. Both sectors can increase the GDP of Bali Province because other sectors or businesses such as lodging services for tourism and export of agricultural commodities are experiencing development. Following the theory of economic basis, the main determining factor of economic growth is related to the demand for goods and/or services from outside the region or exports from the region [3].

The agricultural sector in Bali Province is one of the businesses that contribute to the high revenue. Under the "Tri Hita Karana" motto that the performance of the agricultural sector can be an indicator of ecosystem health and an indicator of community welfare in Bali Province. This is supported by the cultural awareness of Balinese people to the importance of the management and preservation of large natural resources. The system that makes Bali Province famous for its agriculture is "subak" because it has become a world cultural heritage [4]. Subak is a community organization that specializes in regulating the irrigation system and is used in rice farming in Bali Province.

Agricultural land can be distinguished into dry land and rice fields. Rice fields are very important because rice fields are the producing land of basic foodstuffs, namely rice. Other foodstuffs such as soybeans, corn, peanuts, vegetables, and fruits are produced from dry land. However, agricultural land continues to face pressure due to competition with other sectors as a result of population growth and economic growth. This condition resulted in a decrease in the area of agricultural land due to land use conversion.

Population change, population dominant economic function, city size, average housing value, population density, the geographic ability of land for agriculture, and high economic growth rate are the causes of land transfer [5]. Land transfer can lead to a decrease in food production capacity and a decrease in the absorption capacity of agricultural labor and other domino effects. Therefore, monitoring of the dynamics of agricultural land transfer needs to be done. The dynamics of

agricultural land transfer and agricultural sector in Bali Province are analyzed by performing Location Quotient (LQ) calculations, Dynamic Location Quotient (DLQ) calculations, and LQ-DLQ Typology. The analysis was conducted with land use data over a long period of time and Gross Domestic Bruto data of Bali Province, to determine the changes in agricultural land in Bali Province and to know the sustainability of the agricultural sector in terms of production capability in basic the 2015-2020 period by mapping the areas of the base and non-agricultural base sector at the time of analysis and in the future.

2. METHOD

This research is located in Bali Province, Indonesia with coordinates at 08°03'40" - 08°50'48" S and 114°25'53" - 115°42'40" E and has an area of 5,780.06 km². Bali province is bordered by the Bali Sea and East Java Province to the north, bordering the Lombok Strait and West Nusa Tenggara Province to the east, bordering the Indian Ocean to the south, and bordering the Bali Strait and East Java Province to the west. Bali Province consists of eight districts and one city, namely Jembrana District, Tabanan District, Badung District, Gianyar District, Klungkung District, Bangli District, Karangasem District, Buleleng District, and Denpasar City. The Map of Bali Province is seen in Figure 1. This study used land use data and Gross Domestic Product of Bali Province obtained through the website portal of the Central Bureau of Statistics at the provincial level. Based on the availability of data, land use uses data in 2010, 2015, and 2018, while GDP uses data in 2015-2020. The data was then analyzed using a quantitative descriptive approach. The data that has been obtained were analyzed using four methods. Analysis of the dynamics of changes in agricultural land is carried out using the land use balance method and to determine the sustainability of agriculture is carried out using the Location Quotient (LQ), Dynamic Location Quotient (DLQ) and LQ-DLQ Typology.

2.1. Land Use Balance

Analysis of land use change using the land use balance method. The land use balance is an equation of land assets and liabilities in a certain period to determine changes in the area of land use types. Equation (1) is used to calculate land area changes in the initial and final years.

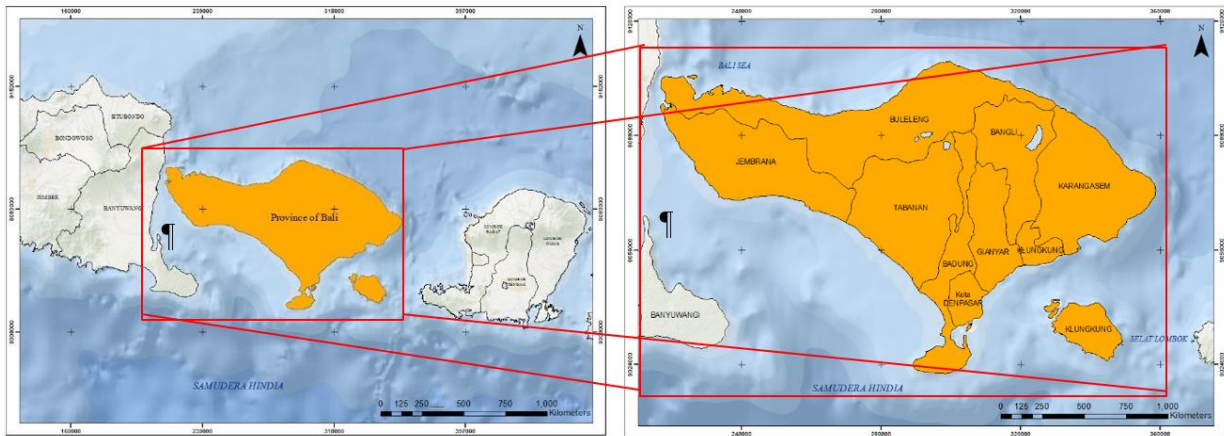


Figure 1 The Map of Bali Province, Indonesia and its surrounding

$$\Delta \text{Land Area} = \text{Passive} - \text{Assets} \quad (1)$$

Note:

Δ Land area = Land use change in the last year to the initial year (ha)

Passive = Land area in the last year (ha)

Assets = Land area in the beginning year (ha)

The results of the land use balance from several years for a long period can be used to determine the dynamics of each existing land, especially agricultural land because it can be seen both the addition and reduction of land area.

2.2. Location Quotient (LQ)

The base sector is an economic activity that produces goods and services, can meet local needs and is able to for export activities. The non-basic sector is an economic activity that provides goods and services for the needs of the community in the economic area of the area concerned only so that the scope of product marketing is local [6]. The LQ method supports basic and non-basic economic analysis in the study location based on the contribution of the sector's GDP to the total GDP of the reference location (province) [7]. The LQ method is calculated using equation (2). The meaning of LQ equation symbols shown in table 1. Based on the calculation results obtained, the value of LQ can be classified as in table 2.

$$LQ = \frac{E_{ij}/E_j}{E_{in}/E_n} \quad (2)$$

Table 1. The meaning of LQ equations symbols

Symbols	Meaning
LQ	Coefficient value of location quotient
E_{ij}	GRDP of agricultural sector in district level
E_j	Total of GRDP on district level
E_{in}	GRDP of agricultural sector in provincial level
E_n	Total of GRDP on provincial level

Table 2. Classification of LQ Value

LQ Value	Classification
> 1	The base sector is prospective if it is further developed to improve the regional economy
= 1	Specialization level with the same sector in a wider area
< 1	Non-base/non-leading sectors that are less prospective if further developed

Based on the classification of LQ values, the higher the LQ value of a sector, the higher the advantage for the region in developing the sector further.

2.3. Dynamic Location Quotient (DLQ)

Dynamic Location Quotient (DLQ) is a modification of the *Location Quotient* (LQ) method which is used as a determinant of the sector whose prospects are developed in the future. The DLQ method analyzes the potential for fast or slow sector development. DLQ is calculated using the following equation (3). The meaning of LQ equation symbols shown in table 3. Based on the calculation results obtained, the value of DLQ can be classified as in table 4.

$$DLQ_{ij} = \frac{[(1+g_{ij})/(1+g_j)]}{[(1+G_i)/(1+G)]} = \frac{IPPS_{ij}}{IPPS_i} \quad (3)$$

Table 3. The meaning of DLQ equations symbols

Symbols	Meaning
DLQ _{ij}	Coefficient value of dynamic location quotient
IPPS _{ij}	Index of potential development of agricultural sector in district level
IPPS _i	Index of potential development of agricultural sector in provincial level
g _{ij}	The growth rate of agricultural sector in district level
G _i	The growth rate of agricultural sector in provincial level
g _j	The average rate of economic growth in district level
G	The average rate of economic growth in provincial level

Table 4. Classification of DLQ Value

DLQ Value	Classification
> 1	Potential for faster development than other districts in the same sector, so that sector i can still be expected to become the base sector in the future
= 1	The potential for development is as fast as other districts in the same sector, so that sector i cannot be expected to become the base sector in the future
< 1	Potential for slower development than other districts in the same sector

2.4. LQ-DLQ Topology

The LQ-DLQ typology analysis serves to determine the potential and role of the sector's contribution in the Province of Bali which will facilitate its development priorities. The typology classification of LQ-DLQ consists of four types as in table 5.

Table 5. Classification of LQ-DLQ Topology

LQ/DLQ	DLQ > 1	DLQ < 1
LQ ≥ 1	The agricultural sector is a leading and prospective sector in the future	The agricultural sector is a leading sector but not prospective in the future
LQ < 1	The agricultural sector is not a leading sector but prospective in the future	The agricultural sector is not a leading sector and is not prospective in the future

3. RESULT

3.1. Dynamics of Change in Agricultural Land in Bali Province

The land resource balance is a step to determine the balance between the availability and the need for land tenure, use and utilization based on the use of certain areas made from two points of the year so that the form of use and the extent of land use changes from two different points of the year can be known [11]. Based on Table 6 to Table 14, changes in agricultural land and non-

agricultural land in Bali Province from 2010-2015 and 2015-2018 have different land changes in several districts but agricultural land, especially rice fields, always experiences a reduction in land area. In 2010-2015 land changes occurred in all districts of Bali Province, namely changes in the use of agricultural land to non-agricultural land. In contrast to land changes in 2015-2018, several districts experienced changes in land use from non-agricultural to agricultural land. However, in that year, it was still dominated by non-agricultural increases. In Table 6 to 14, it is known that changes in non-agricultural land use in Bali Province have increased in land area by 1,469 hectares, in contrast to 2015 to 2018, where the non-agricultural land area has decreased by 53,732 hectares.

In general, the decrease in the area of agricultural land, especially rice fields, is accompanied by an increase in population, so that the need for space for human activities is also higher and converted into non-agricultural land uses such as settlements and other buildings. In addition, the background of the Province of Bali as an area that relies on the tourism industry causes the high conversion of agricultural land to be carried out for development in urban areas and development centers such as tourism areas and other economic areas. The change in the economy's structure started from the primary sector to an economy with secondary and tertiary sectors such as industry and services. The decrease in non-agricultural land area from 2015 to 2018 could be due to the addition of land area in non-rice fields, considering that the Bali Province currently has an increasing tourism sector. The more minor rice fields, the less availability of food that impacts food security. This indicates the need for an agricultural policy strategy [12] [13] [14].

3.2. Location Quotient (LQ) of Agriculture Sector in Bali Province

Location Quotient (LQ) analysis is one method of the economic base model. The LQ method is used to identify the local potential possessed by an area which is divided into basic and nonbasic sectors by presenting a relative comparison between the potential capabilities of the regional sector under study and the potential capabilities of the same sector in the broader area [15] [16]. The areas that are the basis for agriculture are the districts of Jembrana, Tabanan, Klungkung, Bangli, Karangasem, and Buleleng. In contrast, the areas that are not the base sector are Badung, Gianyar, and Denpasar City. The base area can develop the agricultural sector, meet local needs, and carry out export activities because it can serve outside the region. The vast agricultural land and the large number of residents who work as farmers are why this sector is the leading sector. Then the agricultural sector in Badung Regency, Gianyar Regency, and Denpasar City is not included in the basic sector because this sector is not specialized, cannot be exported, and is

less prospective to be developed, and there is a tendency to require the fulfilment of requests from other regions.

The Bandung Regency and Denpasar City areas have an LQ for the accommodation provision sector above 1 ($LQ > 1$), and Gianyar Regency has an LQ for the accommodation provision sector equal to 1 ($LQ = 1$), which means that the three regions have the potential for comparative advantage in the sector [1]. Provision of accommodation versus agriculture. Table 6 and Figure 2, shows the trend of the LQ value of the agricultural sector for each district/city from 2015-2020 varies and fluctuates. The LQ value with a downward trend but still above one for several regions indicates that the region still has a comparative advantage in the agricultural sector, but its growth is slow. The most striking LQ trend is in 2020, where all regions have decreased in value compared to the previous year. This could be related to the Covid-19 Pandemic, which disrupts and weakens activities in the agricultural sector to impact the contribution of the agricultural sector GRDP to total GRDP. The agricultural tends to survive and is not too slumped compared to the other sector in 2020.

3.3. Dynamic Location Quotient (DLQ) and Agricultural Sustainability in Bali Province (LQ-DLQ Typology)

Dynamic Location Quotient (DLQ) is a modification of Location Quotient (LQ), which is one of the techniques in measuring the repositioning of leading sector commodities in the future of an area in the form of time series/trends [17]. Based on the results of these calculations, in Table 7 and Figure 3 it can be seen that the average value of $DLQ > 1$ in the agricultural sector from 2015-2020 is in Jembrana Tabanan, Badung, and Bangli Regencies. A DLQ value > 1 indicates that some of these regencies in the agricultural sector have faster potential than other regencies in Bali Province and are likely to remain superior in the future. Meanwhile, Gianyar Regency, Klungkung Regency, Karangasem Regency, Buleleng Regency and Denpasar City have a DLQ value < 1 , which means that some of these regencies in the agricultural sector are included in the category of lagging or slower in development compared to other districts in Bali Province.

Table 6. LQ values and it classes by City or Districts in Bali Province 2015-2020

City or Districts	LQ Values						LQ Classification 2015-2020
	2015	2016	2017	2018	2019	2020	
Jembrana	1.38	1.38	1.37	1.41	1.45	1.40	Prospective Base Sector
Tabanan	1.48	1.52	1.53	1.57	1.57	1.51	Prospective Base Sector
Badung	0.51	0.51	0.52	0.49	0.49	0.54	Less Prospective Base Sector
Gianyar	0.88	0.87	0.86	0.87	0.86	0.85	Less Prospective Base Sector
Klungkung	1.58	1.55	1.50	1.52	1.49	1.44	Prospective Base Sector
Bangli	1.76	1.77	1.84	1.84	1.86	1.76	Prospective Base Sector
Karangasem	1.83	1.82	1.82	1.81	1.79	1.77	Prospective Base Sector
Buleleng	1.48	1.49	1.48	1.49	1.52	1.44	Prospective Base Sector
Denpasar	0.47	0.47	0.47	0.47	0.47	0.46	Less Prospective Base Sector
Bali Province	1.00	1.00	1.00	1.00	1.00	1.00	

Table 7. DLQ values and it classes by City or Districts in Bali Province 2015-2020

City or Districts	Values of DLQ					Average Values of DLQ	DLQ Classification
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020		
Jembrana	0.989	0.981	1.022	1.018	1.011	1.004	Potential for faster development
Tabanan	1.019	1.000	1.018	0.994	0.993	1.005	Potential for faster development
Badung	1.011	1.024	0.975	1.005	1.020	1.007	Potential for faster development
Gianyar	0.983	0.992	1.009	0.979	0.994	0.992	Potential for slower development
Klungkung	0.978	0.965	1.001	0.978	0.992	0.983	Potential for slower development
Bangli	0.997	1.029	0.986	0.999	0.994	1.001	Potential for faster development
Karangasem	0.989	0.988	0.985	0.979	1.035	0.995	Potential for slower development
Buleleng	1.000	0.992	0.992	1.014	0.982	0.996	Potential for slower development
Denpasar	0.992	1.012	0.996	0.996	0.967	0.993	Potential for slower development
Bali Province	1	1	1	1	1	1	

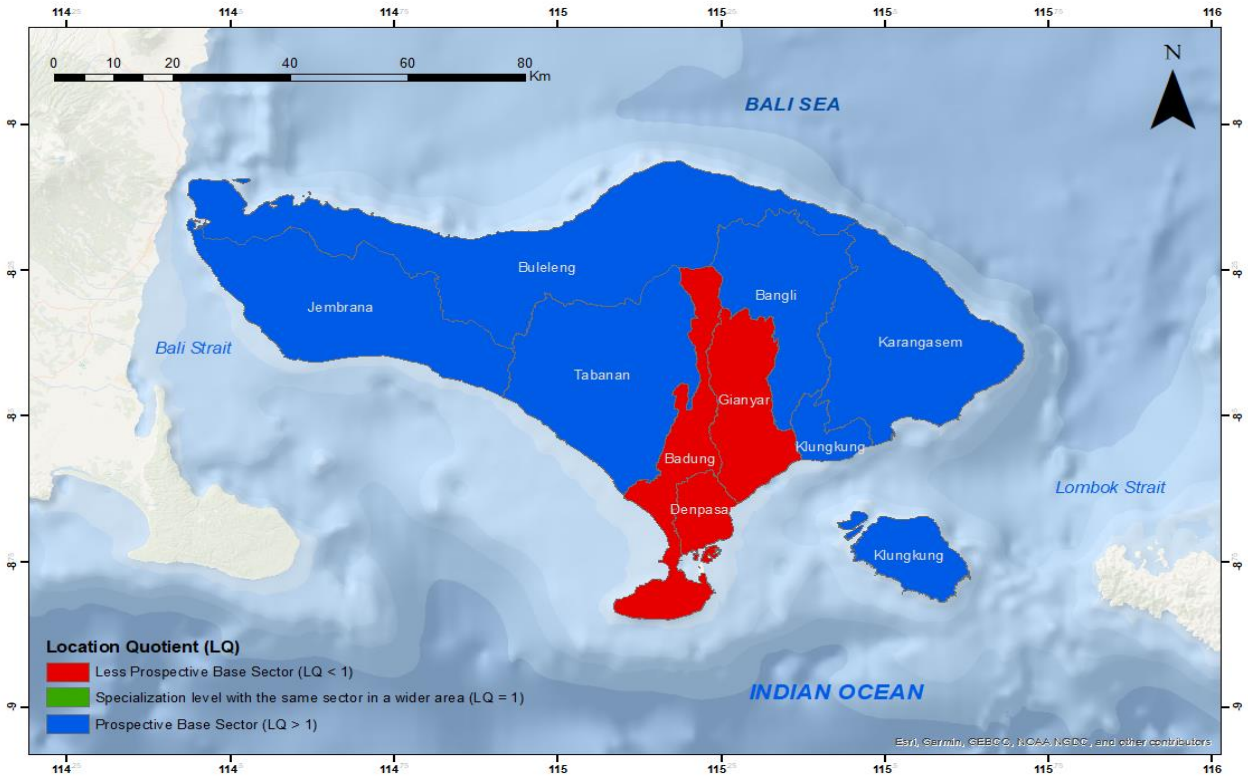


Figure 2 The Map Location Quotient (LQ) of Agriculture Sector in Bali Province Indonesia

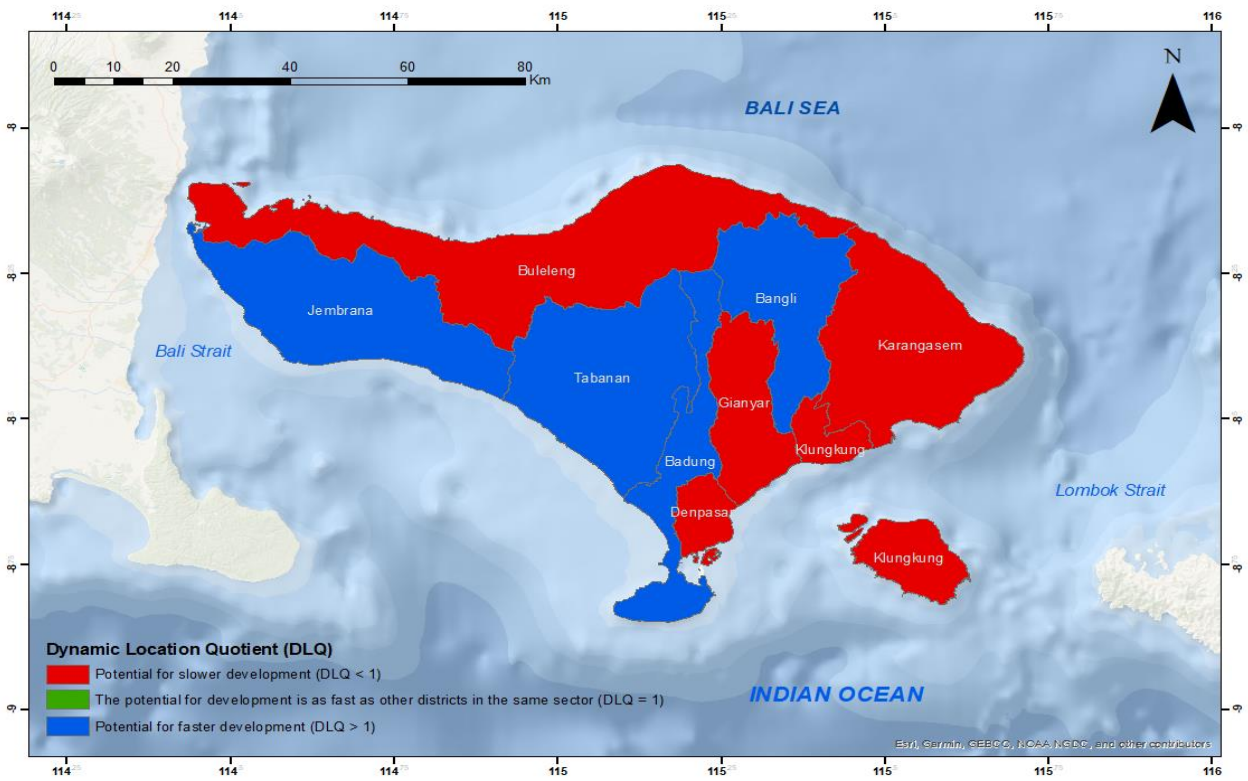


Figure 3 The Map Dynamic Location Quotient (DLQ) of Agriculture Sector in Bali Province Indonesia.

Table 8. LQ-DLQ Topology by City or Districts in Bali Province 2015-2020

City or Districts	LQ-DLQ Topology		
	Average Values of LQ	Average Values of DLQ	LQ-DLQ Topology Classification
Jembrana	1.3994	1.0040	The agricultural sector is leading and prospective sector in the future
Tabanan	1.5284	1.0048	The agricultural sector is leading and prospective sector in the future
Badung	0.5107	1.0070	The agricultural sector is not a leading sector but prospective sector in the future
Gianyar	0.8655	0.9917	The agricultural sector is not a leading sector and not a prospective sector in the future
Klungkung	1.5134	0.9827	The agricultural sector is leading but not a prospective sector in the future
Bangli	1.8054	1.0012	The agricultural sector is leading and prospective sector in the future
Karangasem	1.8072	0.9951	The agricultural sector is leading but not a prospective sector in the future
Buleleng	1.4816	0.9960	The agricultural sector is leading but not a prospective sector in the future
Denpasar	0.4691	0.9926	The agricultural sector is not a leading sector and not a prospective sector in the future
Bali Province	1	1	

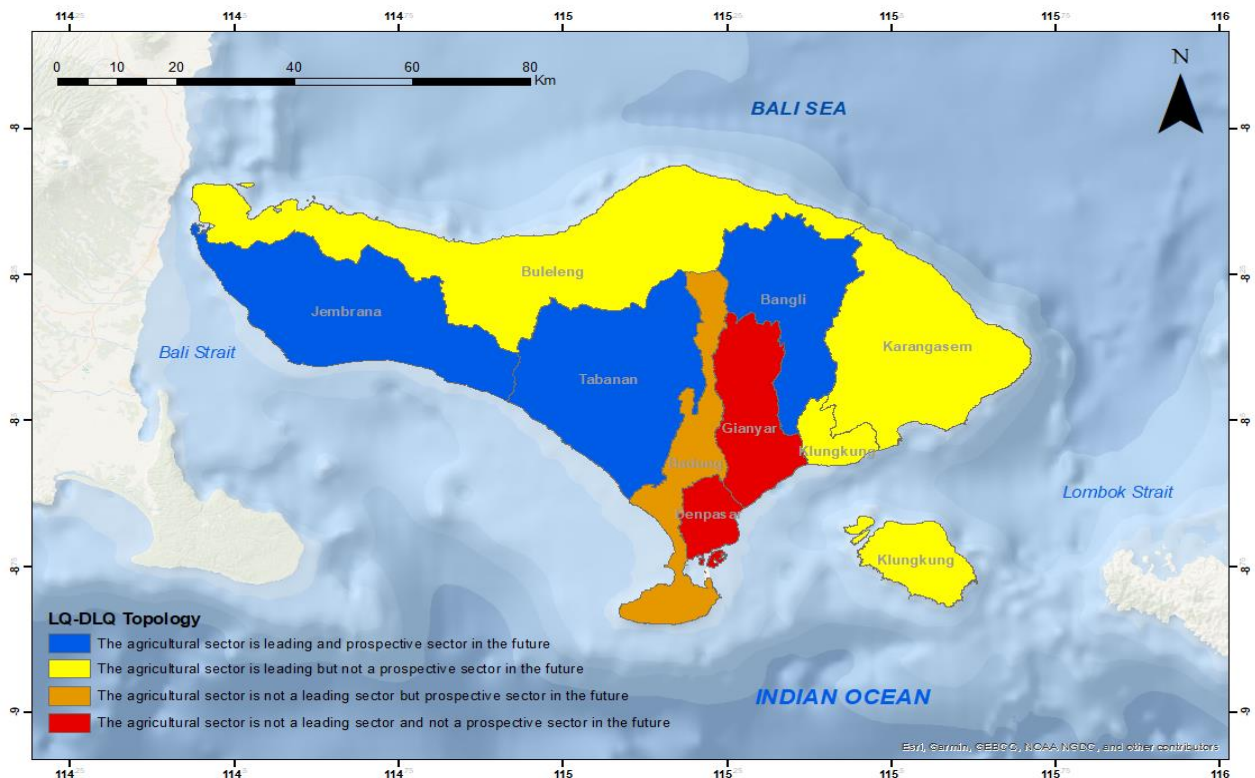


Figure 4 The Map LQ-DLQ Topology of Agriculture Sector in Bali Province Indonesia

Typological analysis of LQ-DLQ is one technique to determine a superior and prospective commodity sector based on indicators of growth and economic income per capita of a region. The LQ-DLQ Topology

method is able to describe the criteria for a commodity sector by looking at the sector being included in the criteria for the leading sector, prospective sector, mainstay sector or underdeveloped sector (Benny and

Eko, 2014). After calculating the 2015-2020 LQ-DLQ typology in Bali Province, it was found that Quadrant I, namely Jembrana, Tabanan, and Bangli Regencies; Quadrant II, namely Badung Regency; Quadrant III is Klungkung, Karangasem, and Buleleng Regencies; and Quadrant IV, namely Gianyar Regency and Denpasar City. This indicates that there are only three districts in Quadrant I because they have $LQ > 1$ and $DLQ > 1$ values so that the agricultural sector in these districts is included in the leading sector or has sustainability in the future because it provides an increase in income and economic growth per capita in Bali Province. Badung Regency is included in the Quadrant II category because it has a value of $LQ < 1$ and $DLQ > 1$, which is a prospective sector or has a prospective opportunity for the sustainability of its agricultural sector in the future. The agricultural sector is low compared to other sectors. Quadrant III is the mainstay sector because it has $LQ > 1$ and $DLQ < 1$ values.

The agricultural sector is the leading sector but has no potential in the future because it has a high growth rate but low per capita income level in this sector. Gianyar Regency and Denpasar City have $LQ < 1$ and $DLQ < 1$ values which are included in the Quadrant IV classification, which is an underdeveloped agricultural sector where this district is not a leading sector and has no potential for superiority because this sector has a per capita level of economic income and its economic growth has a lower value than other sectors [18]

4. DISCUSSION

Dynamic Location Quotient (DLQ) is a modification of Location Quotient (LQ), which is one of the techniques in measuring the repositioning of leading sector commodities in the future of an area in the form of time series/trends. Based on the results of these calculations, it can be seen that the average value of $DLQ > 1$ in the agricultural sector from 2015-2020 is in Jembrana Tabanan, Badung, and Bangli Regencies. A DLQ value > 1 indicates that some of these regencies in the agricultural sector have faster potential than other regencies in Bali Province and are likely to remain superior in the future. Meanwhile, Gianyar Regency, Klungkung Regency, Karangasem Regency, Buleleng Regency and Denpasar City have a DLQ value < 1 , which means that some of these regencies in the agricultural sector are included in the category of lagging or slower in development compared to other districts in Bali Province.

Knowing the LQ and DLQ values of a region indicates that a sector can only meet the needs of its own region or can also meet the demands of other regions because of its abundant production now and in the future. In addition, by knowing the advantages of a sector from the LQ and DLQ values, it can be the basis for formulating efforts to increase productivity specifically through various appropriate programs so that local governments will have clear directions in increasing productivity and maintaining sustainable production from the sector. Agricultural development efforts specifically through appropriate production increase programs will be able to conserve soil, water, and plants so that they do not damage the environment because it aims to maintain the sustainability of production from priority sectors. By developing agriculture by knowing the leading sectors from the LQ and DLQ methods, it will also participate in supporting sustainable development because it is in line with what The Agricultural Research Service (USDA) has conveyed regarding the definition of sustainable agriculture where agriculture in the future will be able to compete, productive, profitable, conserve natural resources, protect the environment, and improve health and food quality [19].

Based on the vision of regional development of Bali Province as a synergistic unit; namely agriculture, tourism and industry. Sustainability of agriculture in Bali Province has a dual and strategic role, namely as a food producer, opening job opportunities, preserving natural and cultural resources, especially subak, which is very much needed by the tourism industry (Bali Province Food Crops Agriculture Office, 2008). Agriculture in the province of Bali is closely related to the role of subak, both concerning agricultural issues in the wetland (wetland subak) and agriculture on dry land (subak abian). The strategy carried out by the government is to formulate a Policy for Submission of Irrigation Management (PPI) according to INPRES No. 3/1999 in Law No. 7/2004, known as Participatory Irrigation Management (PIP), which is the government's effort to give a more significant role to farming communities including subak in irrigation management, as a result of the increasingly limited capacity of the government in terms of personnel and funds, especially to carry out the operation and maintenance (O & M) of irrigation networks.

In connection with INPRES 3/1999, starting in 2008, the Provincial Government of Bali, through the Ministry of Agriculture, implemented the Rural Agribusiness Development Program (PUAP) through

the establishment of rural micro-economic institutions to assist farmers' capital in cultivating their land. Through this agency, the Ministry of Agriculture will provide a budget of Rp. 100,000,000/village with the hope that the funds can be utilized by subak in the province of Bali, starting with the establishment of a farmer cooperative (KOPTAN). This is also related to the Community Empowerment and Agribusiness Development Program for Independent Institutions (LM3) launched by the Ministry of Agriculture.

5. CONCLUSION

Changes in land use have led to a reduction in agricultural land. The implication is that the agricultural sector may not be prospective in the future. Policies are needed to develop the agricultural sector so that the Bali Province can meet the food needs of its region. Districts that have the potential to develop their agricultural sector include Jembrana, Tabanan, Badung, and Bangli, because they have the potential for faster agricultural sector development ($DLQ > 1$). The development of the agricultural sector must also pay attention to the existing agricultural culture, for example, the "subak" culture in irrigation. Districts or cities that are less prospective for agriculture, namely Badung, Gianyar, and Denpasar, can develop their economies into other sectors, such as tourism. This is because agriculture is less prospective in the district or city ($LQ < 1$). Of the eight districts and one city in the province of Bali, only three districts whose agricultural sector is still leading and prospective in the future. The three regencies are Jembrana, Tabanan, and Bangli. These regencies can be used as food storage areas for the province of Bali. Thus, the food needs of the provinces of Bali can be met from their regions.

AUTHORS' CONTRIBUTIONS

The contribution of each author of this paper is listed as follows: Ragil Setiawan was making data processing of LQ, DLQ, LQ-DLQ topology, and designing research; Anugrah Aditya Insani was making maps and creating LQ analysis; Atikah Nian Indrastuti was writing the method and creating LQ-DLQ topology analysis; Dwiyantri Purwanto was creating discussion and conclusion; Hidayati Nur Rohmah was collecting data and creating DLQ analysis; Rahma Permata Suci was creating land use dynamics analysis; Marinda Mustika Ayu was making Abstract and Introduction; Rohayu Che Omar was checking paper writing; Ratih

Fitria Putri was checking the maps, tidying up the paper and its writing.

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REFERENCES

- [1] E. P. Yuendini, I. N. Rachmi, N. N. Aini, R. Harini, M. A. F. Alfana, Analisis Potensi Sektor Pertanian dan Sektor Pariwisata di Provinsi Bali menggunakan Teknik Analisis Regional, in: *Jurnal Geografi Department of Geography Universitas Negeri Semarang*, 2019, pp. 128-136. DOI: <https://doi.org/10.15294/jg.v16i2.20831>
- [2] N. K. Arismayanti, Branding Strategy of Tourism in Bali Based on Cultures and Heritage, in: *8th International Science, Social Science, Engineering, and Energy Conference*, 2017, pp. 1-14.
- [3] L. Muta'ali, Teknik Analisis Regional untuk Perencanaan Wilayah Tata Ruang dan Lingkungan, Badan Penerbit Fakultas Geografi, 2015
- [4] P. O. S. Arsana, M. Susilawati, K. Jayanegara, Karakteristik Sektor Pertanian di Provinsi Bali menurut Subsektor Penyusun, in: *Indonesian Journal of Geography*, 2013, pp. 23-28, DOI: <https://doi.org/10.24843/MTK.2013.v02.i04.p054>
- [5] R. Harini, H. S. Yunus, Kasto, S. Hartono, Agricultural Land Conversion: Determinants and Impact for Food Sufficiency in Sleman Regency, 2012, pp. 120-133, DOI: <https://doi.org/10.22146/jjg.2394>
- [6] E. J. Mangilaleng, D. Rotinsulu. W. Rompas, Analisis Sektor Unggulan Kabupaten Minahasa Selatan, In: *Jurnal Berkala Ilmiah Efisiensi*, 2015, 15 (4)
- [7] G. Gafur, M. Safri, S. Hodijah, Analisis Sektor/Sub Sektor Unggulan di Kabupaten Bungo, in: *Jurnal Perspektif Pembiayaan dan*

- Pembangunan Daerah, 2016, pp. 175-194, DOI: <https://doi.org/10.22437/ppd.v3i3.3519>
- [8] S. Arsyad, *Konservasi Tanah dan Air*, IPB Press, 2012
- [9] T. Eko, S. Rahayu, *Perubahan Penggunaan Lahan dan Kesesuaiannya Terhadap RDTR di Wilayah Peri-Urban (Studi Kasus: Kecamatan Mlati)*, in: *Jurnal Pembangunan Wilayah dan Kota*, 2012, pp. 330-340, DOI: <https://doi.org/10.14710/pwk.v8i4.6487>
- [10] R. Fajarini, B. Barus, D.R. Panuju, *Dinamika Perubahan Penggunaan Lahan dan Prediksinya untuk Tahun 2025 serta Kaitannya dengan Perencanaan Tata Ruang 2005-2025 di Kabupaten Bogor*, in: *Jurnal Ilmu Tanah dan Lingkungan*, 2015, pp. 8-15, DOI: <https://doi.org/10.29244/jitl.17.1.8-15>
- [11] E. P. I. Faroh, F. C. Puspaningrani, G. Reinadova, M. R. Akbar, N. D. S. Anggareni, *Dynamic Changes Analysis of Land Resource Balance in North Maluku Province, Indonesia*, in: *ASEAN Journal on Science & Technology for Development*, 2020, pp. 63-71, DOI: <https://doi.org/10.29037/ajstd.613>
- [12] F. A. Astuti, H. Lukito, *Perubahan Penggunaan Lahan di Kawasan Keamanan dan Ketahanan Pangan di Kabupaten Sleman*, in: *Jurnal Geografi*, 2020, pp. 1-6, DOI: <https://doi.org/10.15294/jg.v17i1.21327>
- [13] A. Rafiudin, W. Widiatmaka, K. Munibah, *Land Use Change Pattern and the Balance of Food Production in Karawang District*, in: *Jurnal Ilmu Tanah dan Lingkungan*, 2016, pp. 15-20, DOI: <https://doi.org/10.29244/jitl.18.1.15-20>
- [14] R. Destianto, B. Pigawati, *Analisis Keterkaitan Perubahan Lahan Pertanian Terhadap Ketahanan Pangan Kabupaten Magelang Berbasis Model Spatio Temporal SIG*, in: *Geoplanning: Journal of Geomatics and Planning*, 2014, pp. 21-32, DOI: <https://doi.org/10.14710/geoplanning.1.1.21-32>
- [15] K. R. Jumiyanti, *Analisis Location Quotient dalam Penentuan Sektor Basis dan Non Basis di Kabupaten Gorontalo*, in: *Gorontalo Development Review*, 2018, pp. DOI: <https://doi.org/10.32662/golder.v1i1.112>
- [16] A. K. Alhowaish, M. A. Alsharikh. M. A. Alasmal, Z. A. Alghamdi, *Location Quotient Technique and Economy Analysis of Regions: Tabuk Province of Saudi Arabia as a Case Study*, in: *International Journal of Science and Research (IJSR)*, 2015, pp. 1756-1761
- [17] A. A. T. Sugiari, *Potensi Relatif Sektor Pertanian dalam Pembangunan Ekonomi Kabupaten Bangli*, in: *Jurnal Manajemen Agribisnis*, 2018, pp. 1-12, DOI: <https://doi.org/10.24843/JMA.2018.v06.i02.p01>
- [18] A. N. Islam, W. H. Riyanto, Y. Syaifullah, *Analisis Pertumbuhan Ekonomi Sektoral dan Sektor Ekonomi Unggulan di Kabupaten Jembrana*, in: *Jurnal Ilmu Ekonomi*, 2019, pp. 532-545, DOI: <https://doi.org/10.22219/jie.v3i4.10261>
- [19] H.L. Nainggolan, J. Aritonang, *Pengembangan Pertanian Berbasis Komoditi Unggulan Dalam Rangka Pembangunan Berkelanjutan (Studi Kasus Kabupaten Humbang Hasundutan)*, in: *Prosiding Seminar Nasional Tantangan Pembangunan Berkelanjutan Dan Perubahan Iklim Di Indonesia. Kerjasama Blh Sumatera Utara Dengan Program Studi PSL SPS USU Medan*, pp. 1-9.